REMARKS

The enclosed is responsive to the Examiner's Office Action mailed on April 4, 2011. At the time the Examiner mailed the Office Action claims 11-13 and 15-20 were pending. By way of the present response the Applicants have: 1) amended claims 1, 16 and 19; 2) added no new claims; and 3) canceled no claims. As such, claims 10-13 and 15-20 are now pending. The Applicants respectfully request reconsideration of the present application and the allowance of all claims now represented.

Claim Rejections

35 U.S.C. 102(b) Rejections

Claims 11-13 and 15-20 stand rejected under 35 U.S.C. 102(b) as being anticipated by Rotenberg ("AR-SMT: A Microarchitectural Approach to Fault Tolerance in Microprocessors") herein referred to as Rotenberg.

With respect to claim 11, Rotenberg does not describe:

> A method comprising:
> dividing a dynamic sequential program into multiple epochs comprising a first epoch instance and a second epoch instance, wherein each epoch includes two or more instructions;
> in a redundant multi-threading (RMT) system having leading and trailing threads, redundantly executing in parallel the first epoch instance and second epoch instance as the leading and trailing threads, respectively;
> for the executed first epoch instance and second epoch instance, saving store results of the first epoch instance and the second epoch instance as speculative stores to memory, the speculative stores being exposed;
> comparing the saved exposed stores; and
> when the exposed stores match, committing a single set of the exposed stores to an architectural memory state corresponding to the dynamic sequential program

First, Rotenberg does not describe "for the executed first epoch instance and second epoch instance, saving store results of the first epoch instance and

the second epoch instance as speculative stores to memory, the speculative stores being exposed." In Rotenberg, instructions executed in the "A-stream" have their results committed and placed into a delay buffer. As such, these results are not "speculative." Additionally, the results of the execution of the same instruction in the "R-stream" are never stored. Rather, these results compared to those stored in the delay buffer. As such, Rotenberg does not describe this limitation.

Second, Rotenberg does not describe "comparing the exposed stores" saved in memory are not compared.

Third, Rotenberg does not describe "if the exposed stores match, committing a single set of the exposed stores to an architectural memory state corresponding to the dynamic sequential program." As detailed by Rotenberg, in his system the results of the "A-stream" are committed regardless of when the comparison of the delay buffer contacts and the "R-stream" says. Thus does not describe this limitation.

Accordingly, Rotenberg does not describe claim 11. Claims 12-13 and 15 are dependent on claim 11 and are allowable for at least the above rationale.

With respect to claim 16, Rotenberg does not describe:

> A method, comprising:
> redundantly executing a program broken into multiple epochs by redundantly executing each epoch separately, and
> sending speculative results for each epoch to memory;
> checking the speculative results in memory for each epoch against each other; and
> when the speculative results match, committing a single set of the speculative results to an architectural memory state corresponding to the program

First, Rotenberg does not describe, "sending speculative results for each epoch to memory." In Rotenberg, instructions executed in the "A-stream" have their results committed and placed into a delay buffer. As such, these results are not "speculative." Additionally, the results of the execution of the same

instruction in the "R-stream" are never stored. Rather, these results compared to those stored in the delay buffer. As such, Rotenberg does not describe this limitation.

Second, Rotenberg does not describe "checking the speculative results for each epoch against each other" saved in memory are not compared.

Third, Rotenberg does not describe "if the speculative results match, committing a single set of the speculative results to an architectural memory state corresponding to the program." As detailed by Rotenberg, in his system the results of the "A-stream" are committed regardless of when the comparison of the delay buffer contacts and the "R-stream" says. Thus does not describe this limitation.

Accordingly, Rotenberg does not describer claim 16. Claims 17-20 are not described by Rotenberg for at least the reasons detailed above.

Claims 11-13 and 15-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Reinhardt et al. ("Transient Fault Detection via Simultaneous Multithreading") herein referred to as Reinhardt.

With respect to claim 11, Reinhardt does not describe:

> A method comprising:
> dividing a dynamic sequential program into multiple epochs comprising a first epoch instance and a second epoch instance, wherein each epoch includes two or more instructions;
> in a redundant multi-threading (RMT) system having leading and trailing threads, redundantly executing in parallel the first epoch instance and second epoch instance as the leading and trailing threads, respectively;
> for the executed first epoch instance and second epoch instance, saving store results of the first epoch instance and the second epoch instance as speculative stores to memory, the speculative stores being exposed;
> comparing the saved exposed stores; and
> when the exposed stores match, committing a single set of the exposed stores to an

architectural memory state corresponding to the dynamic sequential program

First, Reinhardt does not describe "for the executed first epoch instance and second epoch instance, saving store results of the first epoch instance and the second epoch instance as speculative stores to memory, the speculative stores being exposed." In the cited section, Reinhardt describes recording the results of a first instruction instance into a register check buffer. "When the corresponding instruction from the other thread leaves the RUU, the index and value are compared and, if they match, the register file is updated." However, there is no saving of the result of the second instruction instance.

Second, Reinhardt does not describe "comparing the saved exposed stores" as it does not describe the previous limitation.

Finally, Reinhardt does not describe "when the exposed stores match, committing a single set of the exposed stores to an architectural memory state corresponding to the dynamic sequential program." Again, the second instance is not saved and then compared, and as such, there is no commit based upon such as saved store.

Accordingly, Reinhardt does not describe claim 11. Claims 12-13 and 15 are dependent on claim 11 and are allowable for at least the above rationale.

With respect to claim 16, Reinhardt does not describe:

A method, comprising:
redundantly executing a program broken into multiple epochs by redundantly executing each epoch separately, and
sending speculative results for each epoch to memory;
checking the speculative results in memory for each epoch against each other; and
when the speculative results match, committing a single set of the speculative results to an architectural memory state corresponding to the program

Reinhardt does not describe at least the underlined limitations for rationale similar to the above. Claims 17-20 are not described by Reinhardt for at least the reasons detailed above.

In light of the comments above, the Applicants respectfully request the allowance of all claims.

CONCLUSION

Applicant respectfully submits that all rejections have been overcome and that all pending claims are in condition for allowance.

If there are any additional charges, please charge them to our Deposit Account Number 02-2666. If a telephone conference would facilitate the prosecution of this application, the Examiner is invited to contact David F. Nicholson at (408) 720-8300.

Respectfully submitted,

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